THE

Universal Clock Adjuster.

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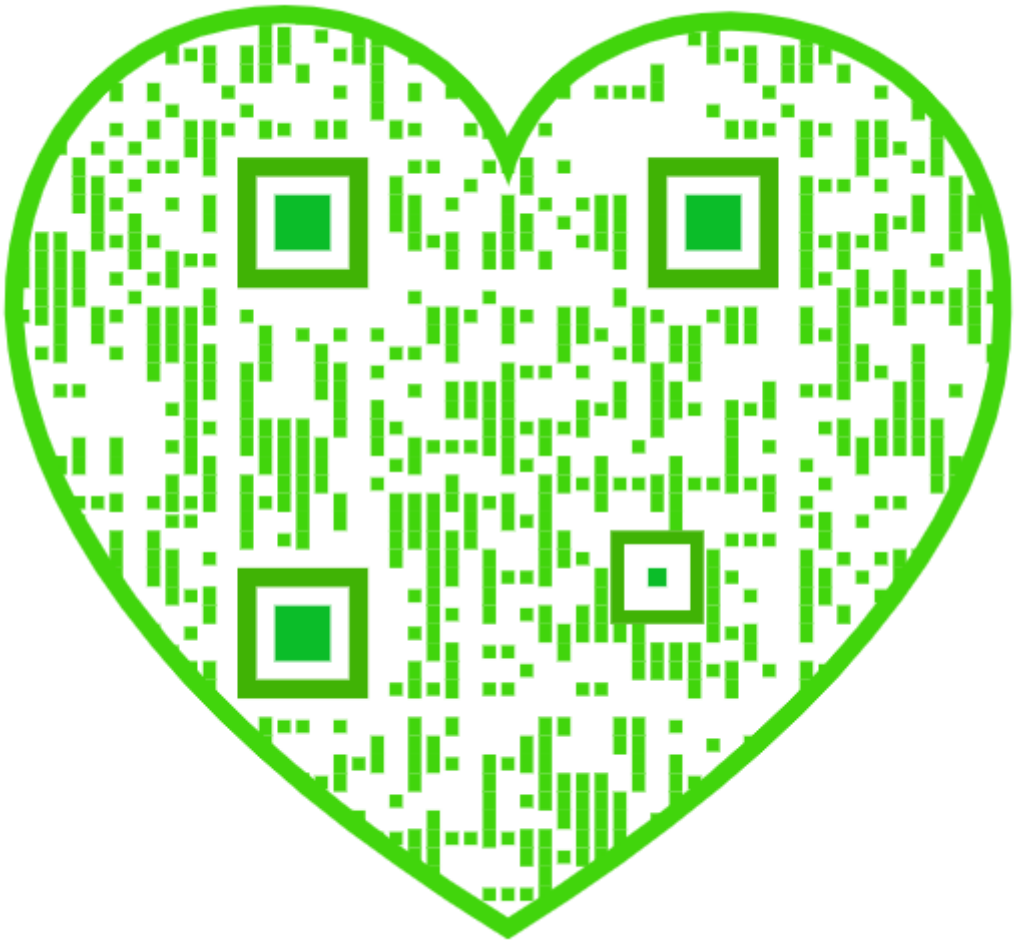

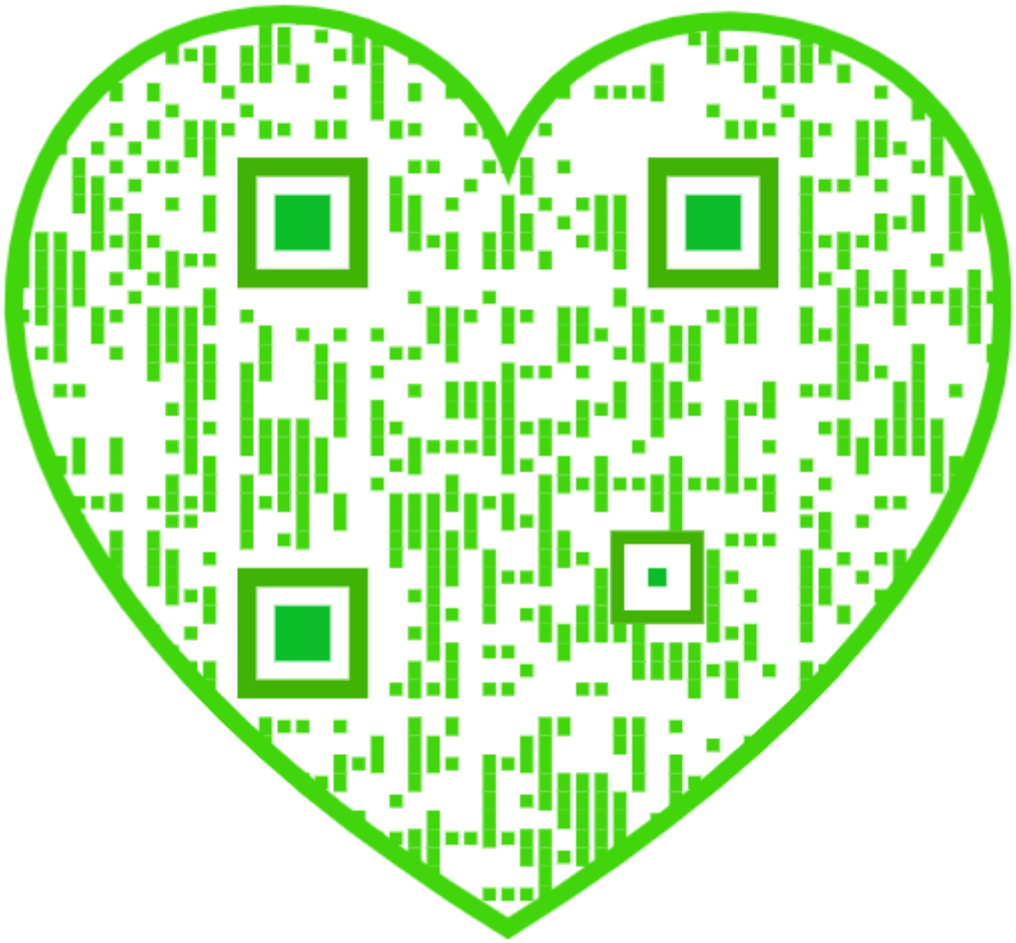

THE

UNIVERSAL CLOCK ADJUSTER·

OR,

EVERY ONE HIS OR HER OWN CLOCK CLEANER AND IMPROVER.

BY

ELEAZAR THOMAS PERDUE.

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PREFACE.

THE AUTHOR, having been a practical clock fixer for nearly a quarter of a century, and having never failed, in a single instance, to make a clock run and keep good time, thinks that he has learned something about clocks; and being a man of only common sense, he proposes, in this little volume, to teach any other person of common sense how to adjust, clean, and improve their clocks and keep them running all their lives, at only the trifling cost of this book and the little time it takes to do the work, which time varies from one minute to two hours (the last only when the clock has to be cleaned). When a clock stops, the first thing is to find out what to do (that is, what part to work on), and the next is how to do it, and these two things are just what this book will teach you, and teach you in words so few and in language so plain that no one can fail to succeed. It is respectfully offered to an intelligent and discerning people upon its merits alone, without farther comment.

PART THE FIRST.

TREATS MOSTLY OF THE RUNNING WORKS.

EXPLANATION OF NAMES AND PARTS.

CASE—The piece of furniture that contains the works.

DIAL—The metal or wooden plate that has the twelve numbers representing the twelve hours of the day.

HANDS—The indicators attached to the centre shaft, pointing towards the figures on the dial.

WEIGHT OR SPRING—The power that propels the works.

PULLEYS—The little wheels on top of the case, having grooves in which the cords work.

DRUM—The cylinder on the main shaft, on which the cord winds and raises the weight when the key is applied to the post or end of main shaft. There are two drums, one on the running and one on the striking side.

CORDS—The strings that are attached to the top of the weights, pass over the pulleys, and wind on the drum. (Pulleys, drums, and cords are on weight clocks, but not generally, though they are sometimes all three used, though in a different position, in the spring clock.)

Post—The end of the main shaft, on which the key works when the clock is being wound.

Saw Notches—The notches around the main shaft at the back of the drum or spring, which notches catch against a button on the driving wheel and hold the power against the works.

Drum, or Spring Button—The button that falls in the saw notches on the main shaft, and is attached to the driving wheel.

Button Spring—The little wire spring attached to the driving wheel, with the end resting in a little groove in the button, thus holding it in the saw notches.

Driving Wheel—The cog wheel on the main shaft that drives all the other wheels and works.

Main Shaft—The shaft on which the drum, if a weight clock, or the main spring, if a spring clock, and also the driving wheel, is attached.

Shaft—Any rod that has ends working loose, as journals, in the front and back plate of the frame.

Cog Wheel—Any wheel having cogs or teeth on the edge, which work in the pinion on the next shaft.

Pinion—The small wheels on the shafts that work in the cogs of the large wheels.

Journal—The end of any shaft that works in the frame.

Centre Shaft—The shaft in the centre of the clock on which the minute hand works.

HOLLOW SHAFT—The shaft on which the hour hand works, being hollow through, so that the minute hand shaft works inside of it. This shaft makes one while the minute hand shaft makes twelve revolutions.

CENTRE WHEEL—The thick wheel on the minute hand shaft, in the back side of the brass frame, in which the main driving wheel of a daily, or the next wheel if an eight-day clock, works.

RAISE—A bent wire attached to the minute hand shaft, which is the only point of communication between the running and striking works.

ESCAPEMENT WHEEL—The small wheel at top of and outside of the brass frame, having cogs or teeth in which the pallets of the verge work.

VERGE—The cam whose ends or pallets work in the teeth of the escapement wheel, and whose centre of motion is on a movable button. It also has a wire extending down to, and has a loop at the end through which the pendulum wire passes, thereby giving motion to it

VERGE PIN—The little wire pin in top of the verge button, on which the verge hangs and works.

VERGE BUTTON—The button with the pin in the top, on which the verge hangs. This button can be moved farther from or nearer to the escapement wheel, thus putting the verge shallower or deeper in gear.

VERGE KEY—The little wire that you turn against the end of the verge pin, to hold the verge on.

PENDULUM WIRE—The long wire on which the ball hangs, and which passes through the verge loop and hangs in the stud above.

PENDULUM BALL—The ball that hangs to the bottom of the pendulum wire, and works to right and left.

WHAT STOPS A CLOCK.

1. Pendulum ball loose on the wire that passes through it.
2. Pendulum ball not hung square, but oblique to its direction (not striking the air edgeways).
3. Notch worn in pendulum wire where it passes through the verge loop.
4. Thin, springy part of pendulum wire bent, twisted, or loose in the stud in which it hangs.
5. Verge loop too large or too small, or either end of said loop pressing against the pendulum wire.
6. Verge hanging with one pallet nearer than the other to the escapement wheel.
7. Button on which the verge hangs turned too near or too far from the escapement wheel.
8. Cord off the pulley or off the drum.
9. Dial, or any part of the case, pressing any of the works, causing them to bind.
10. Being waxed up with oil and dust.

11. Any wheel, cog, shaft, or pinion, loose, bent, or twisted.
12. Hands hung together, or bearing against the dial or the glass in the door of the case.
13. Being greatly out of a level.
14. Weight too light or spring too weak.
15. Shelf, mantel, or whatever supports the clock, being rickety, making it easily jarred.

It may be that several of the above-named causes combined prevent the clock's running, yet several of these imperfections may possibly exist at the same time (in a slight degree), and still the clock run and keep good time, but any one of these impediments, if it exists to any extent, is sufficient to, and will stop the clock.

Examine carefully each and all of these parts in the rotation in which they are numbered, and correct it or them as instructed.

CLOCK TOOLS.

All the tools necessary are a small hammer, a small pair of pincers, a small brush such as painters use, a common hand-saw, file, and a vial of oil, with a wire about the size of a medium knitting-needle, to apply the oil, and a small screw-driver.

PROPER ADJUSTMENT.

Of the Case—Consists in having it level both ways, and on a strong, firm mantel or sup-

port; also, to be fastened to the chimney or wall at the back.

Of the Works—In having them not to bind by the case nor the frame that holds them.

Of the Pendulum Ball—In having it fast on the looped wire that passes through it; hung true and square, *i. e.*, not oblique to its direction.

Of the Pendulum Wire—In being perfectly straight, hung true, square, and tight in the stud in which it hangs, and no notch (to any extent) allowed to be worn where it passes through the verge loop.

Of the Verge—In having the wire bent so that the teeth in the escapement wheel will hold against either of the verge pallets when the pendulum is still, and the loop in the end be closed so that it will be very near but not tight around the pendulum wire.

Of the Verge Button—In having it turned near enough to the escapement wheel for one of the verge pallets to be clear of, while the other is holding a tooth, but not so far that the teeth will pass by both pallets at once.

Of the Buttons on Main Wheels—In having them in the saw notches and the end of the little wire spring in the groove on the top.

Of the Cords—In being in the pulleys at top and winding properly on the drum, so there will be only one layer.

Of the Dial—In having it tight on the case, but not touching the pendulum, verge, or any of the working parts.

Of the Hands—In having them so they will not hang together and will not press against the dial, and on tight, so they will not drop about.

Note.—Before putting on the minute hand, put the key on the centre or minute hand shaft, and turn to your right until the clock strikes; then put on the minute hand, pointing up to figure twelve, otherwise your clock might strike with the minute hand at three, six, or nine.

TO REGULATE A CLOCK.

To regulate a pendulum clock, if it runs too slow, raise the pendulum ball by means of a screw at the bottom; and if it runs too fast, lower the ball by the same means. A very little alteration makes a great difference. To regulate a chronometer, or balance wheel and lever escapement, move the little pin or handle of the regulator (that appears through a slit in the dial) towards the letter F, for faster, or towards the letter S, for slower.

CLOCK WELL KEPT.

A clock that has been well cared for, and not improperly oiled, needs nothing inside the brass frame but the use of a dry brush, with which you will carefully brush every part, turning the wheels to present new parts to

the action of the brush. Use a very small painter's brush, and be sure you leave no bristles in the works. Use a little kerosene oil on the escapement wheel, verge, pallets, and pivot or support, and on the pendulum wire where it passes through the verge wire loop, to perfect the cleaning.

When care has been taken, and the dust kept out as directed under the head "Care of a Clock," your clock will need cleaning very seldom, and the pendulum wire and verge wire, from natural causes, will need adjusting oftener than your clock will need cleaning, though generally such little care is used in the keeping that the opposite of this is the case. If you have been particular in the care of your clock, you have made for yourself

A SHORT WAY.

1st. Examine the pendulum ball, and see that it is not loose on the wire that passes through it, and that it hangs true and square (*i. e.*, not obliquely to the direction of its beat), so that the edges will cut the air.

2d. Examine the pendulum wire, and see that it is straight, that the notch which is worn in it where it passes through the verge wire loop is not worn too large (the wearing of this notch stops more clocks than are stopped from any other cause), and that the thin spring at top is not bent or twisted; also that it is tight in the stud in which it hangs.

3d. Examine the verge and see that the loop has not worn too large where the pendulum wire passes through—that it does not rest with one pallet nearer than the other against the escapement wheel.

The above embraces the causes enumerated from one to six inclusive, under the head of "What Stops a Clock," and in nineteen out of twenty cases one or more of these six causes will be what is the matter. You will tighten the pendulum ball on the looped wire that passes through it by hammering the lead down to it on the back side. You will make it hang square by twisting the looped wire to the right or left, as the case may be, until you get it true and square. You will straighten the springy or top part of pendulum wire with the fingers, and tighten it in the stud by pressing writing paper with it in the slit. You will file the notches out with a hand-saw file, sloping off your filing three-quarters of an inch above and below. You will close the verge loop with the pincers, so that you just see a small space between it and the pendulum wire. You will bend the verge wire to the right or left, as the case may be, until either of the pallets will hold against a tooth of the escapement wheel when the pendulum is still. You will have to bend and try, when perhaps you will find that you have bent it too much. You must then, of course, bend back the other way, and notice which pallet holds and which passes when the ball is still, and keep at it

until either will hold; then try your clock by carrying the ball to the end of its beat either side, and letting it go, and your adjustment is completed. This (when the clock does not need cleaning) can all be done by only taking off the hands and dial, and without taking the works from the case or the case from where it stands. You can also oil all the parts that should be oiled (directions for which you will find under the head of "To Oil a Clock") without farther dissection of the parts, and consequently can be done very quickly.

NOTE.—A clock that has been improperly oiled, and has only dry dust instead of wax, needs only a dry brush used inside the frame. Kerosene you only use to get off wax.

NOTE.—When the clock is clean, a proper adjustment of the pendulum ball, pendulum wire, and verge, will, in nineteen out of twenty cases, make the clock run well and keep good time.

TO TAKE THE WORKS FROM THE CASE.

First take the hands off. Then the dial, which is sometimes put on with small screws, and sometimes with wires bent at right angles; one arm, the longest one, being driven in the frame, and the other arm turning over the edge of the dial. Take out the screws with a small screw-driver or turn the

bent wire one-quarter round, which will then be from over the edge of the dial, which you can then take off. Then take off the pendulum ball, and then the pendulum wire, by taking hold of the springy part at top, close to the stud, and pulling it gently forward out of the slit. Then take hold of the lower end, and draw it down out of the verge loop. Then take the little key or wire from against the verge centre, and then with the right hand take off the verge, and with your left hold a finger against the escapement wheel, to keep the weight or spring from running too rapidly down. You may, however, let it run briskly down, and then, if a weight clock, proceed to take off the weights, by unhooking or untying the cords and taking them off. Now untie all the knots that are in the cords, and take the hooks, if any, from them, so they will not hang in pulling over the pulleys at top of the clock. Then pull them from the top by taking hold of the cord near the drum. You will now unscrew and take off the wooden button, if any, at top of the brass frame, which holds the works to the back of the case. You will now push the wires back from the perpendicular wooden pieces (which remain in the case) into the holes, about half an inch in diameter, that are in the cross-bar at the bottom of the brass frame, and comes out with it. If a wooden instead of a brass clock, there is no button holding the works, but there are four round holes in the front plate, near each cor-

ner. Only push the wire pins back out of the uprights (which uprights remain on the case) into these holes, and your works are loose. You have now only to take them from the case. You are now prepared

TO CLEAN THE CLOCK.

If your clock has been badly kept, by cracks or holes of any kind allowed to remain in the case, or the door not fitting closely, thereby letting in the dust, and if you have to add to these the fact that the clock has been improperly oiled, it will be so filthy and waxed up with oil and dust that you cannot even examine it properly until it is cleaned. To clean such a clock, a regular clock fixer would take the brass frame loose (if a brass clock) and wash all the wheels and works in hot water and castile soap, or (if a wooden clock) by nicely scraping all the wax off with a penknife, and then brushing with a dry brush. You can clean the wooden clock in the same way, for you can, by being particular, very easily scrape and brush the works without taking them apart (which it is not prudent to do); but the best way to clean a brass clock is to use kerosene oil. Pour the oil slowly over all the wheels and works, frame and all, and be sure it goes to every part; after which use a very small painter's brush (one that has never been used for anything else). Brush through all the wheels, shafts, and pinions. Be sure that no bristles are left in the works. After

brushing all the parts that the brush can get to, wind the spring or cord a little, and then pull the cord, if a weight clock, which will turn the wheels, or if a spring clock, the spring will turn them rapidly as soon as you take off the key. This presents new parts of the wheels and pinions to the action of the brush. Repeat this operation several times, pouring in more oil until all the wax is loosened and brushed off. A quarter of a gill of kerosene oil is enough for the whole operation. Be doubly sure, and have every particle of wax and dust from the escapement wheel, from every part of the verge, and from the pendulum wire where it passes through the loop of the verge wire. If a wooden clock, never use kerosene oil or water on any of the wooden parts, as either will ruin it. You must therefore confine yourself to brushing and scraping, but be sure and not scrape into the wood. You are now prepared

TO EXAMINE THE CLOCK.

Look carefully through all the works inside the frame. See that the cogs on all the wheels work properly in their pinions. See that none of the wheels or pinions are loose on their shafts, and none of the shafts are bent, and the wheels true on their shafts. All these you can correctly ascertain by turning the wheels briskly and examining each while in motion. If you find anything broken or badly bent inside the frame, you had best

have a good clock-fixer work on it at once; but in ninety-nine out of a hundred cases you will find that after your clock is cleaned there will be nothing wrong inside the frame. If you find nothing wrong, as above described, but that all works evenly and truly, you may decide positively that there is nothing wrong inside the frame. Now examine the escapement wheel (the little brass cog-wheel outside the frame at top). If this wheel, or the shaft on which it works, is broken, bent, or twisted, you will have to have it mended by a regular clock-man; but as it is barely possible that anything is the matter with this wheel, after being well cleaned, you will likely find it all right. The difficulty is now reduced to the verge, the pendulum wire, or the pendulum ball. For the proper adjustment of these you are referred to instructions under the head of "A Short Way." Before adjusting these, however, you will have

TO PUT THE CLOCK TOGETHER.

First, put on the verge, and turn the little wire key against the pin on which the verge hangs, to hold it on; then put the works in the case; shove the wire pins in their places; screw on the wooden button (if any) at top of and back side the works, to hold them to the case. Now take the cords (if a weight clock). First carry them through the slits in the wooden uprights and under the pulleys in the same (if any), and then over the pulleys at top, carrying them up on the side of

the pulley next the centre of the clock and bringing down on the side of the pulley farthest from the centre. You will next put on the weights, then the pendulum wire, and then the pendulum ball. You are now ready to adjust the verge, the pendulum wire, and pendulum ball. For adjustment of these you are referred to instructions under the head of "A Short Way." After adjusting these properly and trying your clock some fifteen or twenty minutes, to see that it will surely run, you may proceed to put on the dial and the hands. Be very particular that the works do not bind in the case, and that the dial does not press against any of the moving works, also that the hands do not press the dial, but that the dial and hands are put on firmly and true, so that they will not be loose or fall about.

PROMISCUOUS INFORMATION.

As it is the force of gravity that draws the pendulum ball from the highest part of its arc downward, and as this force increases or diminishes as bodies approach towards or recede from the centre of the earth, so in the extremely northern or southern latitudes the pendulum will vibrate and the clock go faster than at or near the equator, because the earth at the equator rises farther from its centre than at the poles. For this reason a pendulum would have to be longer at the poles, for the rate at which a clock goes depends on the number of vibrations its pen-

dulum makes. For the same reason a clock that would keep exact time at the foot of a mountain would go too slow at its top, and the same clock in the bottom of a deep mine would go too fast. Gravity only affects pendulum clocks. It has no effect on chronometers or watches.

Experience proves that clocks that have been long in use require more power—that is, the weight has to be heavier or the spring stronger. This is caused by the wear in the cogs and pinions causing side friction in addition to that on the face of the cogs, thereby making it harder to propel. This affects the brass clock to a much greater degree than the wooden, from the fact that, the wheels being thin, the face of the cogs are narrow and wear deeper in the pinion. If, therefore, after your clock being properly adjusted, it refuses to run, you will make the weight about double as heavy by running lead around the sides and at the bottom.

If a spring clock runs well when first wound, but fails to run the length of time required, you may know that the spring is too weak.

Any one will find clock adjusting a much easier matter than they suppose. You need not by any means understand all the names and parts by heart. Many clock-fixers have been successful who happened to learn the secret of the pendulum ball and wire, and the verge, who could not take the wheels and shafts from the frame and put them properly

back. Indeed, it is not necessary to do so, and I advise all persons not to try unless they already know how, for the wheels and shafts are not numbered, and therefore no book could be written teaching you to put them properly in the frame. Don't be heavy-handed, or, in other words, don't overdo what you are trying at. A very little alteration makes a great difference. For this reason ladies are apt to succeed with less trouble than men, while all the work is light and can be done by any lady. Any one, after commencing, becomes interested, and learns more the farther they go, until they become really fond of the work. With the instructions given in this book it needs no mechanical genius at all, for you have only to do exactly what you are told, and need nothing but common sense to make you successful.

CHRONOMETERS.

Round clocks, or, as they are generally called, chronometers (though there is no good reason why they should be so called more than any other clocks, the word chronometer meaning a measurer of time, it would be equally proper to call any other clock by that name), differ from other clocks in that they have no pendulum, but in place thereof have a balance wheel and small spring (called a hair spring) on the same shaft and a lever on the verge shaft. These are exactly balanced on their centres or bearings, and therefore the clock will run in any position like a

watch. Indeed, the movements are the same. For this reason they are used on railroad cars, steam and other boats and vessels, or anywhere that locomotion would prevent a pendulum clock's running. They are adjusted by taking up the small or hair spring shorter, if you wish it to go faster, or letting the spring out longer, if you wish it to go slower. If the spring or balance-wheel shaft is too loose or too tight in its bearings, alter it, as the case may be, by screwing or unscrewing the large short screws in the ends of which said shaft is held. If the forked end of the lever that spans this shaft should be too open, close it a little, or if too close, open it. If the escapement wheel rests harder against one than the other of these verge pallets, turn the lever on the shaft that passes through its centre until the teeth escape from both alike. If too deep in gear, move the verge farther from, and if too shallow, nearer to the escapement wheel. In the working, the balance wheel is turned first one and then the other way (like a child's whirligig). In other words, it oscillates by the winding and unwinding of the spiral hair spring, and the said balance wheel by its weight, and through the lever, verge, and wheels, is impelled by the main driving spring, thus in its turn winding and unwinding the hair spring. When the forked end of the lever is acted on by the balance wheel and hair spring carrying it in one direction, one tooth of the escapement wheel escapes by one of

the verge pallets, and when the balance wheel oscillates or changes its direction, the lever is also moved in an opposite direction, and another tooth escapes from another pallet, and so on. The other works are like any other spring clock with a pendulum escapement, except that the chronometer is seldom supplied with striking works. It is also furnished with a second hand, which few of the pendulum clocks have. Sometimes in sickness the second hand is a very useful and convenient attachment. These clocks should be cared for and cleaned in the same manner as other clocks, only be very light-handed when handling the hair spring and lever. Oil the verge pallets and centre, the forked end of lever, and ends of balance wheel shaft in their bearings. Half a drop is enough. Use the best oil.

PART THE SECOND.

TREATS OF THE STRIKING WORKS.

EXPLANATION OF NAMES AND PARTS.

BELL — The metal on which the hammer strikes, giving forth sound.

BELL WIRE — The curled wire attached to some bells to make them give a rich, musical sound.

HAMMER—The ball (at the end of a wire) that strikes the bell.

HAMMER WIRE—The wire having the ball or hammer at the end.

HAMMER SHAFT—The shaft to which one end of the hammer wire is attached.

HAMMER LEVER—The wire with one end attached to the hammer shaft and the other end resting on the pins in the striking wheel.

STRIKING WHEEL—The wheel with pins in the side; these pins, as the wheel revolves, drawing the lever, and by it the hammer, back to strike the bell. This wheel is generally the main driving wheel in the daily and the second driver in the eight-day clock.

HAMMER SPRING — The small wire spring curled several times round the hammer shaft and attached thereto, and also to the frame, holding the hammer up to the bell.

COUNTING WHEEL—The wheel having twelve deep and sixty-six shallow notches, the counting wire falling in the shallow notches to count all except the last stroke, when it falls in a deep notch and allows the clock to stop (but does not itself stop it). In the wooden clock the counting wire rests on the side of the shallow notches and only falls in the deep ones; consequently, there are seventy-eight shallow and twelve deep notches in the wooden clock.

COUNTING WIRE—The bent wire flattened at the end, that falls in a notch of the

counting wheel at each stroke of the hammer. This wire is fastened to the same shaft that the stop wire is, and, consequently, they rise and fall at the same time.

STOP WIRE—The wire bent at right angles horizontally, and resting on a flange on the side of the wheel. This flange has a notch in it, in which the bent part or end of this wire would fall at each revolution, but being on the same shaft with the counting wire, it can only fall in this stop-notch when the counting wire falls in the deep notches of the counting wheel.

START LEVER—The wire attached to the same shaft with the counting and stop wires. This lever has a bent end resting on the top of the U wire, and of course rises when the U wire rises and lifts the stop wire out of the stop notch and prepares the clock for striking.

U WIRE—The wire bent somewhat in the shape of the letter U, only much longer. The bottom prong of this wire rests on the minute hand shaft. When this shaft revolves the raise attached thereto lifts the U wire, and through it the others.

TEMPORARY STOP—This is a wire attached to the U wire shaft and rises with it, the end coming in contact with a pin on the fan shaft, thus making a temporary stop after the main stop wire is raised out of the main stop notch. In the wooden

clock the little pin is on the wheel next the fan instead of being on the fan shaft. This temporary stop keeps the clock from striking until the minute hand points to figure 12, when the end of the U wire drops from the raise wire down on the minute hand shaft, carrying the temporary stop wire down from against the pin, allowing the clock to strike.

FAN—This is at the top of the striking works, is made of sheet brass, tin, or zinc, and in the wooden clock of wood, having wings on each side of the shaft. Coming in contact with the air makes a resistance that regulates the speed of striking. If these wings are too large the clock will strike too slow; if the wings are too small it will strike too fast.

FINGER WIRE—The little wire with the end hanging at the bottom of and back of the dial, that you push or pull with your finger to strike the clock until it strikes the number indicated by the hands on the dial.

WHAT CAUSES A CLOCK TO STRIKE BADLY.

1st. Bell wire loose, or turned on the bell, or the bell loose on the case.

2d. Hammer wire bent too near or too far from the bell.

3d. Hammer spring broken or too weak.

4th. Hammer lever off the pins in the striking wheel.

5th. Counting wire bent too far up, making it strike one each time and stop.

6th. Counting wire bent too far down, causing it to strike until the weight or spring runs down.

7th. Temporary stop wire not striking the pin when the main stop is raised, causing it to strike five or ten minutes too soon, and too many.

8th. Start lever not bent down near enough the U wire, causing it not to strike at all.

9th. Fan too small, causing it to strike too fast, and over numbers. Sometimes down.

10th. Fan too large, causing it to strike too slow, and sometimes stop altogether.

Examine all these carefully, so as first to be sure where the difficulty is, and then correct it according to instructions.

PROPER ADJUSTMENT.

Of the Bell—Consists in having it screwed tight to the case, and the curled wire (if any) tight to the bell.

Of the Hammer—In having it strike the bell true, but not rest quite against it (when still), so as to prevent vibration.

Of the Hammer Lever—In resting properly on the pins in the striking wheel.

Of the Hammer Spring—In having it fastened to and curled three or four times around the hammer shaft, with the other end fastened to the frame, and taken up sufficient to force the hammer against the bell.

OF THE COUNTING WIRE—In being bent so that when in the deep notches of the counting wheel the stop wire (on the same shaft) will fall in the stop notch or come against the stop pin, as the case may be, but not so that the stop wire will fall in stop notch or come against the stop pin when the counting wire is in the shallow notches.

OF THE U WIRE—In having it open enough to raise the stop wire out of the stop notch five to ten minutes before the minute hand points to twelve, and so the end will fall down from the raise wire at that time.

OF THE TEMPORARY STOP—In having it bent so it comes in contact with the pin on the fan shaft (or in the next wheel to it), when the main stop wire is raised out of the stop notch, or from against the stop pin in some clocks.

OF THE FAN—In being true and equally balanced on its shaft, and the proper size for the clock to strike fast enough without striking too fast.

OF THE START LEVER—In having it bent near enough down on the U wire for said wire to raise the stop wire out of the stop notch, or from against the stop pin, some five or ten minutes before time to strike.

NOTE.—If the weight or spring runs down as fast as wound, without driving the works, you may know that the little button is off the saw notches (on the driving wheel), or that

the little spring has come off the button, either of which you can make right in a moment.

NOTE.—If the works run and do not move the centre shaft, you may know that the centre wheel is not keyed on tight enough. You remedy this by making a washer (about the size of an old-fashioned three-cent piece) out of common tin, with a hole in the centre the size of the shaft. Cut a slit from this hole out at the edge, so that you can press it between the pin and centre wheel on the back end of the centre shaft. After getting on, press the edges so as to close the slit. This will tighten the wheel on the shaft, and cause it and the hands to revolve. Do not make it too tight, or you cannot turn the minute hand when you wish to set the clock.

DESCRIPTION AND INFORMATION.

The striking side of a clock is on your left as the clock stands before you, and contains about as many wheels, pinions, and wires as the running side, but they remain at rest until the minute hand shaft makes one revolution, which causes it to strike, after which all the works remain at rest for the next hour. The striking, like the running works, are propelled by a weight or spring, that would make it strike until it run down but for proper stops being provided. The bell is sometimes solid metal, but in clocks of the present day more frequently has a curled wire attached to it, giving forth a rich, full

sound, instead of the sharp, keen sound of the former. The hammer is attached to a shaft, and rests near but not against the bell, and is adjusted by bending the wire on which it is in such direction as to keep it in its proper place, for if too near the bell it will impede its vibration, and cause it to give a poor, smothered sound, and if too far it will not strike at all. There is another wire attached to the hammer shaft (called the hammer lever, resting against the pins in the striking wheel. When this wheel revolves (partly), a pin draws the hammer from the bell, and when the pin pulls off the end of the wire the hammer is forced by the spring against the bell, and when the next pin draws the lever back and pulls off, the same operation is repeated. This wire is adjusted by bending near to or farther from said wheel, as need may be, to make it strike. There is a short wire bent at right angles and attached to the minute hand shaft, called the raise wire, and another long wire bent in shape of the letter U, only much longer. This U wire rests on the minute hand shaft, and when said shaft revolves the raise attached thereto raises the U wire, which in its turn raises the start wire, which rests on it. This start wire or lever is attached to the stop wire shaft, and of course raises the stop wire out of the stop notch or from against the stop pin, as the case may be. The clock would now strike, but as it is several minutes too early (and the works are necessarily obliged first to be put in this pre-

paratory position), a temporary stop is made by a wire attached to the U wire shaft, and when said U wire is raised the temporary stop wire raises and comes in contact with a pin on the fan shaft, or sometimes this pin is on the next wheel to the fan shaft This keeps the clock from striking until the minute hand points to twelve, when the U wire drops from the raise wire down on the minute hand shaft, carrying down the temporary stop wire from against the pin that holds it, and allows the clock to strike. The clock having commenced striking, and the stop flange or stop pin making one revolution each time the hammer strikes the bell, would strike one and stop at each revolution of the minute hand, but there is a wheel called a counting wheel, which revolves once in twelve hours, having seventy-eight notches (twelve of them deep and sixty-six shallow) in it. There is a wire called a counting wire, with the end bent down and flattened, which drops in these notches. This wire is attached to the same shaft with the stop wire, and when it falls in the shallow notches does not allow the stop wire to come low enough to stop the clock. Thus the clock will continue to strike until the end of the counting wire falls in a deep notch, which causes the stop wire to come low enough to catch in the stop notch or against the stop pin, and stop the clock properly. This counting wire is adjusted by bending up, down, or sideways, to make it fall in the notches of the counting wheel right. Thus,

if your clock strikes one and stops, bend the end of the wire down, so that when it rests in a shallow notch, the stop wire (on the same shaft) cannot come in the stop notch or against the stop pin, but do not bend it so much that when it rests in a deep notch the stop wire cannot fall in the stop notch or against the stop pin. If you do your clock will strike until it runs down. Bend and try, and bend back the other way if you have bent too much, until you find that you have it just right. The fan regulates the striking. If, therefore, you wish your clock to strike faster, cut the wings of the fan so it will come in contact with less air; if you wish it to strike slower, put a larger fan on the fan shaft. Common tin will do to make it of.

GEARED DIFFERENT.

The striking as well as the running works of different clocks are geared up differently. The description herein given applies to the brass clocks (both weight and spring), mostly used in this country at the present day. The striking works of the wood clock differ in some respects from the brass. For instance, the counting wire rests by the side of the shallow notches on the counting wheel and only falls into the deep ones. Again, the stop wire in some of them acts also as a temporary stop by another pin in the same wheel striking it when it is raised. They are adjusted in the same manner; that is, you bend the counting wire up or down, as the case may

be, so that the stop wire will only come in contact with the stop pin in the wheel when the counting wire is in the deep notches on the side of the counting wheel, and miss this pin when out of these notches. If the stop wire also acts as a temporary stop, you must make it strike the temporary stop pin when it moves from the other or permanent stop pin. The general principles of all clocks being alike, you can easily learn to adapt your adjustment to the slight variation in the gearing.

ALARM BELLS

Are very useful appendages, and no clock should be without one. They can be attached to nearly all pendulum clocks. The works of an alarm bell consist of a small brass frame containing one large or driving wheel and one small or verge wheel, and of course only one pinion. The spring is fastened to the main or driving wheel shaft; it has a verge that works in the teeth of the escapement or verge wheel, but has a hammer instead of a pendulum attached to the verge shaft and coming in contact with the bell. The escapement wheel receiving its power directly from the driver, runs with great force and speed, and works the verge back and forth, making the hammer strike the bell so rapidly as to cause a loud roaring sound, which continues until the spring runs down. The brass frame must be screwed down on the back of the case (inside), near enough the bell for the hammer to reach it.

It has a small brass dial, one and a half or two inches in diameter, which works on the hour hand shaft. This dial has twelve numbers, commencing at one and increasing from left to right (just as the clock dial); there is a flange on the back side of the dial which has a deep notch in it, and there is a wire fastened to the frame of the clock, (so it will work loosely). The other end of this wire is bent horizontally at a right angle; this bent end rests on the flange of the dial. There is then a small flexible connecting wire fastened to this and extending down and fastened to a small wire that extends out from the verge shaft. This connecting wire must be tight enough to keep the upper verge pallet deep in the teeth or cogs of the escapement wheel and keep the works from running down until the dial, by its revolution, causes the top wire to drop in the notch in the flange. This slackens the tension of the connecting wire, thereby loosening the verge, so that the teeth of the wheel can escape from each pallet alike, which works the verge and makes the hammer strike rapidly until the spring runs down. The works are adjusted by moving the verge nearer to or farther from the escapement wheel, as needed, and by tightening or loosening the connecting wire that extends up to the dial. They can be set to strike at any hour during the night or day, except between the hours of eleven and twelve. (At this time the upper wire is in the notch, and the works will, of course, run down as

fast as and directly you wind it up.) You therefore cannot set it to strike at a more distant time than about eleven hours from the time of winding it up. To set the alarm bell, turn the dial on the hour hand shaft (from left to right, but never the other way), until the time on the dial that you wish to be aroused comes under the hour hand. When once set it will strike at the same time each night or day, and only needs to be wound up, but not reset. The verge pallets and journals and the teeth of the escapement wheel should be well oiled, not so much to make it work easy as to keep from wearing.

PART THE THIRD.

GENERAL INFORMATION ON CLOCKS.

CHOICE OF A CLOCK.

Fashion rules clocks as well as most other things. The little spring clock of the present day differs greatly from the clock of fifty years ago. In choosing a clock, select one with thick wheels (the cogs will have a wider bearing and last longer), thick pinions made of solid metal, and the front and back plates thick (for the same reason); all the works smooth and uniform. Weight clocks vary less from the extremes of heat and cold than spring clocks, from the fact that in the former you have only the pendulum wire to be expanded or contracted, while in the latter

you have the pendulum wire and the main spring both acting in the same direction, viz., making the clock go faster in cold and slower in warm weather. Brass springs vary still more, the expansion or contraction of brass when compared with steel being as 100 to 61. Brass springs, however, never break, while steel springs very frequently do. If, for instance, from any cause a little rust comes on any part of a steel spring (which is very thin) it will cause it to be weaker at that point than anywhere else, and finally break. A weight clock is less expensive than a steel spring, for the reason that if a cord breaks you can make and put on a new one, while the steel spring, when broken, will cost you time and money. But a brass spring clock is even cheaper in the end than a weight clock, for there is nothing that will break. Although a brass spring clock will vary more from the extremes of heat and cold than any other, yet this variation is not sufficient to materially interfere with the measurement of time for ordinary purposes. Like other clocks, it has to be adapted to the seasons by regulation, and only needs a wider scope of the regulator to effect the purpose. The old-fashioned wooden clock will last many times longer than any metal clock with the same care. This seems incredible, but has been and is still being proved. A metal dial is preferable to wood, and catgut cords are the best. Choose a clock, also, that has large post or driving shaft, as the key will have

more power, and both post and key will last longer, and large centre or minute hand shaft for the same reason. Eight-day clocks are preferred by some, but they have to be much more nicely adjusted, and consequently give more trouble in that particular. but less in winding. Being opened less frequently, they also receive less dust. Choose a clock, also, that the door opens down to the very bottom of the case, for the reason that the dust can be brushed out more easily. Choose a key made of steel, iron, or some metal other than brass, as that will leave an unpleasant smell on the hand whenever used.

CARE OF A CLOCK.

An ounce of preventative worth a pound of cure applies very forcibly to clocks, for certainly if you keep your clock well, you will have to clean it seldom, and *vice versa*. The mantel, or whatever supports the clock, should be firm and steady, and, if possible, level both ways. The verge should be adjusted to make it run without having wedges anywhere under the case. The case should also be fastened back with a screw, or otherwise, to the chimney or whatever the back rests against. Every crack or hole of any kind, no matter how small, should be stopped with putty. The cover over the pulleys at top (if any) should fit perfectly. All around the edge of the door should be tacked or glued a narrow strip of flannel, or other soft cloth, sufficiently thick to make the door

press tightly in. The time of winding should be the earliest possible after rising in the morning, as there is less dust in the room then than at any other hour during the twenty-four. Nothing of any kind, not even the key, should ever, for any reason, be kept inside the case. Be sure and never strike the pendulum ball or wire at the bottom, for a very slight upward pressure will bend the springy part of this wire at top and certainly stop the clock. Open the door when and only when indispensably necessary. Have the key and also your hands perfectly clean before putting them in the clock.

TO OIL A CLOCK.

The frequency of oiling, like that of cleaning, depends in a great measure on your success in keeping out the dust. I have reliable testimony as to one clock (an old-fashioned twenty-four hour wood clock) that ran and kept good time without being cleaned or oiled, or anything else except winding, for a little more than thirty-four years. The parts that you should oil are the verge pallets, the pivot on which the verge turns, the journals of the escapement wheel shaft, and the pendulum wire at the point where it passes through the loop of the verge wire. This last needs oiling oftener than the other parts, for the reason that the oil runs down the wire below the point of contact. It is also the most important part to be oiled, for the reason that it is the farthest point of friction

from the power, any wax (from the mixture of oil and dust) or stiff, thick oil, or the smallest impediment of any kind at this point causing great resistance to the power. This point should be oiled two or three times a year, putting on a very little (for if you put too much it will all run down the wire). The other parts might go a year or more, but it depends on the dust that may or may not get in, and also on the kind of oil used. Be sure and brush off all the old oil and wax before applying fresh. Apply with a wire the size of a medium knitting-needle. One drop is sufficient for the whole. Be sure and not oil any except the parts above named, and not use too much oil.

CLOCK OIL.

The best clock oil is said to be manufactured from the jawbone of the black fish. It is very limpid and of fine texture, extremely mucilaginous, and will stand the extremes of heat and cold with less variation, and also stand age better than any other oil. It is sold in small vials, containing about fifty drops, for twenty-five cents per vial. If a clock be well kept one vial will last about fifty years, but if you wish something cheaper (though this is cheap enough), or if you cannot obtain the genuine, a very good oil can be made by mixing the best sperm oil and kerosene oil, equal parts. Kerosene alone is not lubricating, and is so susceptible to capillary attraction that it will spread and not

remain on the parts that need oil, and will very soon all be taken off by evaporation. Kerosene is recommended in this work only to clean metal clocks that have been improperly oiled, and are gummed with wax, but by no means to oil any clock when used alone, for the cogent reasons above named. Those who think that their experience proves otherwise are beguiled by the fact that the clock had been previously oiled with some other oil, which had become waxy by dust, and the kerosene mixed with and softened the wax and made the clock run, or perhaps the clock, being well adjusted, would have run without any oil. Genuine clock oil is recommended to be used when it can possibly be obtained.

VARIETY OF CLOCKS.

Clocks are of various forms, sizes, and mechanism, constructed of different materials. Most clocks are very simple in their construction, but some few are very complicated. There are clocks that not only tell the half seconds, seconds, minutes, and hours, but in addition tell the day of the week, of the month, and of the year; also, the changes of the moon are shown just as they appear in the moon itself, gradually increasing in size each day, from the new to the full, and decreasing from the full to the new moon. Some have a mechanical attachment to the striking works, so that you can fasten a cord to a wire that comes through the case and tie the other end to the bed-post. At any

time in the night that you wake and pull this cord the clock will strike the number that it struck last, and will repeat it as often as you pull the cord, so that you can approximate within less than an hour of the time of night without rising. There are other clocks that will perform many wonderful feats, but they are more curious than useful. There is said to be a clock in London that will run thirty-five years without winding. If this is so, princes have been born, reigned, and died, empires have flourished and fallen, and discoveries and inventions have been made that revolutionized the world inside of one winding, the old clock continuing to measure and signal time, the destroyer of all things mortal.

PRINCIPLES OF MOTION.

In the motion of the clock, as well as all other machinery, speed is generated at the expense of power. This is true to a mathematical nicety. The weight or spring being the power, and the ball, or lower end of the pendulum, having the greatest speed, shows at once how very important it is that the pendulum be well adjusted. Next in importance is the proper adjustment of the verge. Any impediment of the pendulum creates the greatest resistance to the weight or spring, any impediment to the verge the next greatest resistance, and any impediment to the escapement wheel the next greatest resistance, and so on, becoming less and less as you advance through the works to the power.

So, also, in the striking works, the greatest force of a given resistance begins with the fan (that having the greatest speed), and diminishes in degree in traveling through the wheels towards the power. Power is transmitted from the weight, or spring, through the system of wheels and pinions, to the escapement wheel, and from the escapement wheel to the verge, by a tooth in said wheel coming with force enough against the (lipped or turned) pallet of the verge (the moment after a tooth escapes from the other pallet), to give to the verge, and through it to the pendulum, such an impetus as to force the ball a little farther than it would otherwise go, thus causing the clock to run. The pendulum governs the running and the fan the striking works.

PENDULUM WIRE TO MAKE.

Take any piece of common soft wire of the proper size; hammer the upper end with a small hammer on a very smooth surface until it becomes as thin as a ribbon and very springy; take a space sufficient to have the spring about two inches long when finished; leave a small space just at the end, two or three times as thick as elsewhere, in order that it may hang in without pulling through the slit in the stud in which it hangs; then place the thin part on the smooth end (not side) of a hard block of wood, and put a sharp pocket-knife on and strike it with a light hammer, cutting enough from each side to

leave it the proper width; then dress down with a hand-saw file until thin and smooth enough; then take the measure and cut off the right length; then bend the hook at bottom end, and be sure to bend this hook in the direction of the edge (not the side) of the springy part above. Have the whole perfectly straight and free from rust.

NOTE.—The cords of a clock should be sufficiently small for one layer on the drum to allow the weight to reach the bottom of the case. If more than one layer be on the drum the clock will not run regular, and, worse, sometimes the cord of the top presses in between the courses of the bottom layer, and causes the clock to stop.

PROFESSIONAL CLOCK FIXERS,

As a class, are no worse than other men. They, like all other classes, are composed of good and bad, skillful and ignorant, competent and incompetent. Travelling clock fixers, as a whole, have received a large share of abuse that should only have been applied to the ignorant or unprincipled; but even with those that are both honest and competent the pay is so little that it is a very poor business, from the fact that they may travel for days and not find a still clock, or if they find one, the owner has been humbugged so often by rascals that he refuses to employ them. Or, if the travelling clock fixer makes your clock run, and warrants it for a year, you pay him one or two dollars, and he

leaves, having probably got his supper, breakfast, lodging, and two horse feeds. Your clock stops in a month (I mean where the man is competent and honest, for no man is infallible), and where is the clock fixer? In a distant part of the State, or perhaps in some other State. Do you expect him to come the distance to fix one clock? Can he afford to do it? To ask the question is to answer it. Local clock fixers are more reliable, from the fact that you know where to find them. The writer has been a local clock fixer, having never travelled more than five miles from his residence in following the business, and can prove that all clocks he ever fixed, even those fixed more than twenty years ago, are running now, though they have been cleaned and readjusted several times in that number of years; but then few neighborhoods in the country have a local clock fixer, from the fact that there is not a sufficient amount of still clocks to make it pay him. This, together with the travel, even when a few miles, makes clock fixing, as a profession, a poor business. And yet an owner of a clock, even if he can get a clock fixer when he wants him, so as to save the annoyance of a still clock, will find that by paying one or two dollars each year or two will soon increase to a considerable amount. The business not being profitable to the clock fixer, does not prevent its being expensive to the clock owner. The fact is, the travel destroys the profits to the clock

fixer, while the owner that can fix his own clock is right at it, and can do the work without any expense whatever. I therefore advise every owner of a clock, instead of spending a dollar or two each year, to spend fifty cents for a life-time by buying the UNIVERSAL CLOCK ADJUSTER (it will not in the end amount to as much as that, for with care it will last for your children and grandchildren), and to all honest clock fixers, whose business does not pay, my advice is, take an agency for the UNIVERSAL CLOCK ADJUSTER, and make more money in one year than you can in a life-time by fixing clocks.

ADDRESS TO THE PEOPLE.

I ask the kind indulgence of the people for any and all literary imperfections (and doubtless there are many) contained in this work, having only one object in view, viz., that set forth on the title-page, of teaching all owners of clocks to adjust, fix, and clean them. I confess that I have not been very particular as to its orthography or phraseology. I have been as brief and also used as little reiteration as possible, though some reiteration in a work of this kind is unavoidable. I have also endeavored to use as few technical terms as possible, but have instead used names and terms by which the parts described will be most easily recognized, and am sure that any one who tries can easily learn all that the book teaches. I therefore feel a conscientious pride in knowing that

the purchaser will get many times the value of the small amount that the book costs. Knowing also that there is a universal need of just such a work, I respectfully dedicate it to the people of every class, trade, profession, and calling, any and everywhere, who speak the English language and own a clock, and solicit and anticipate from them a liberal patronage.

E. THOMAS PERDUE.

FINIS.

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